REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

Corrected Copy

NO: TX634D139B DATE: February 18, 1983 PAGE 1 OF 6

DEVICE TYPE: Source Housing

MODEL: 5202

MANUFACTURER/DISTRIBUTOR: Texas Nuclear Corporation
A Subsidiary of Ramsey Engineering Corporation
P.O. Box 9267
Austin, Texas 78766

SEALED SOURCE MODEL DESIGNATION: Texas Nuclear Model 57157C

ISOTOPE: Cs-137 MAXIMUM ACTIVITY: 500 millicuries

LEAK TEST FREQUENCY: 36 months

PRINCIPAL USE: Gamma Gauges

CUSTOM DEVICE: ____ YES __X__ NO

CUSTOM USER:

B/S

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

Corrected Copy

NO: TX634D139B DATE: February 18, 1983

DEVICE TYPE: Source Housing

DESCRIPTION: This source housing is contructed of lead-filled, welded steel containing all of the features normally associated with a manually operated device. The source housing is a right circular cylinder welded to a base plate and mounted with two welded steel "L" bars. It is approximately 5 1/2 inches in diameter by 5 1/2 inches high by 8 inches wide and weighs approximately 68 pounds.

The source is retained in the lead filled housing by the use of a spring load, stainless steel spacer, stainless steel internal snap ring and a stainless steel source tube and is sealed from the environment by a stainless steel expansion plug.

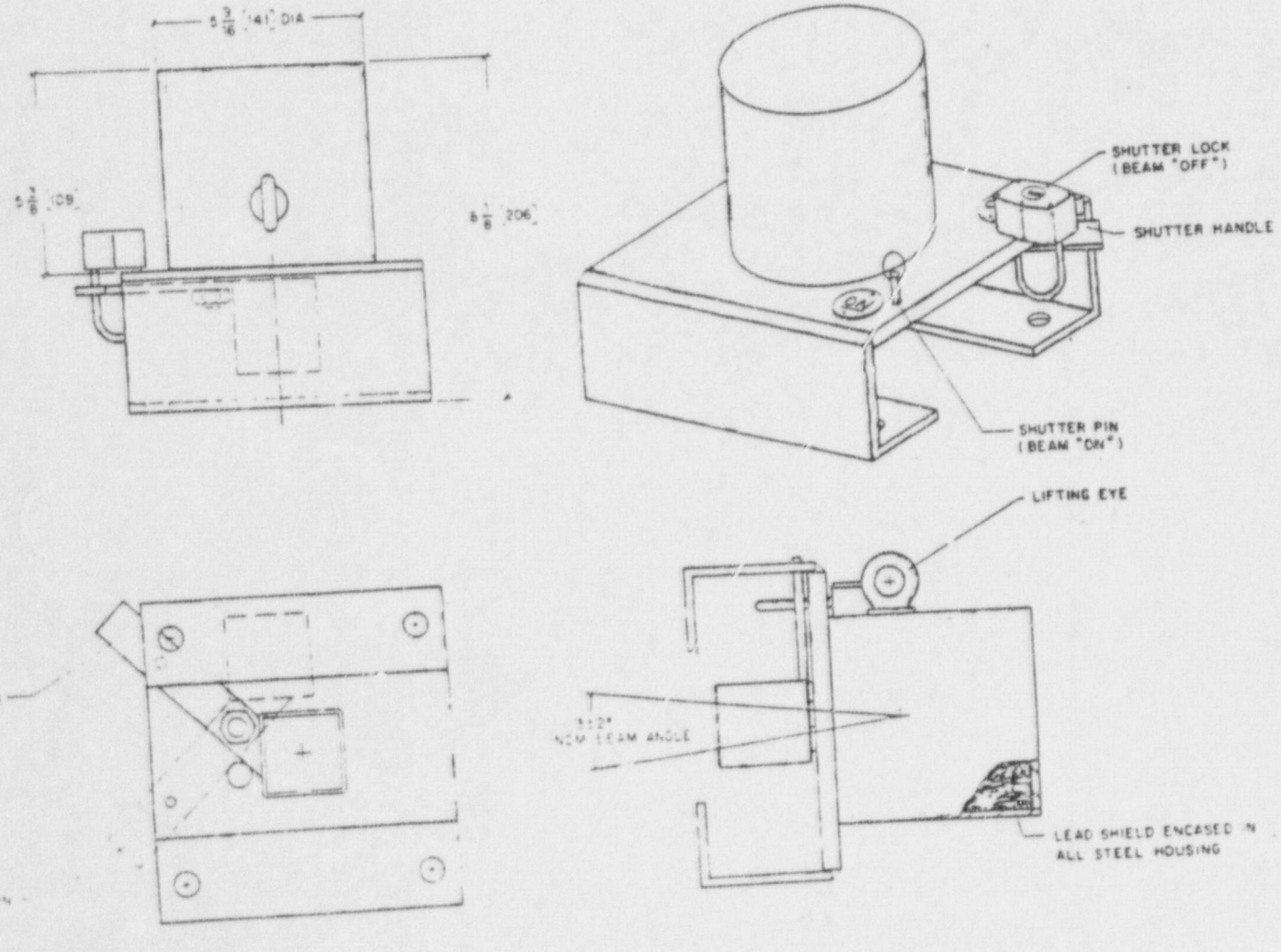
The shutter is comprised of a lead-filled, all welded stainless steel canister secured by welding a steel guide bolt to a steel bar to prevent it from inadvertent movement by vibration or shock. The shutter has both an ON and OFF position indicated on the source head by tags and is secured in the OFF position by lock and the ON position by pin. In the ON position, the beam is emitted into approximately a 13 degree beam angle, conical in shape.

LABELING: The gauge is tagged with a standard tag, containing the company's name, trade mark, and symbol and the model, isotope, amount of activity, date of measurement, CAUTION RADIOACTIVE MATERIAL, and DO NOT REMOVE. The tag is stainless steel and the radiation symbol is color coded. Additionally, the device contains a separate caution tag which uses both words and symbols to caution users to keep their hands out of the beam area as an added safety feature. The third tag is a shipping bolt tag which serves to caution those individuals not authorized to install and survey gauging devices not to proceed with opening the shutter. For those devices distributed to general licensees, another tag will be added which specifies all details and conditions of general license distribution and the requirements that the user must follow as set out in the Texas Regulations for Control of Radiation 41.28 (d)(1)(iii). These tags are manufactured using a second surface printed polyester laminated with pressure sensitive adhesive. These tags are approved by UL and CSA with these adhesives and tamperproof construction.

: TX634D139B DATE: February 18, 1983 PAGE 3 OF 6

DEVICE TYPE: Source Housing

DIAGRAM:



REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

Corrected Copy

DEVICE TYPE: Source Housing

CONDITIONS OF NORMAL USE: This device is used in making density, level and interface measurements on all types of industrial process lines in industrial environments, on drilling platforms, ships, submarines, dredges, barges, trucks, lowered into the ocean, etc. It is difficult to conceive an environment, short of extremely high temperatures, in which the devices could not be safely used. The typical user would include any manufacturing process including food and, therefore, environments could range all the way from extremely harsh (by way of acids, corrosives and/or toxic vapors and fumes) to laboratory sterile rooms with preconditioned air. They could be used both above and below ground with an expected temperature range of 400°F to -100°F. These devices are routinely used as component parts of other systems. Their care and maintenance is minimal. These devices will withstand extremely harsh environments. As long as the temperatures do not exceed the melting point of lead they can remain in use. If temperatures exceed the melting point of lead, the device will fail in an inoperable mode; that is, the first void volume closed by lead expansion will be the beam port. Short of vaporizing lead, the device should not fail in a condition that constitutes an unacceptable hazard. If the lead is vaporized, the failure will occur at the expansion plug and the lead will continue to run out until temperatures drop and the lead solidifies. In the worst case, the source will remain in the head and one will simply have an external radiation problem. This shutter block has been designed so that it is visually accessible to the user; therefore, one can access any loss of lead by simply inspecting the beam port and shutter block.

PROTOTYPE TESTING: Prototypes were tested in accordance with American National Standard N538-1979, published as NBS Handbook 129. As as result of those tests, this device was assigned a classification of ANSI 64-434-455-R3.

EXTERNAL RADIATION LEVELS: This device is designed to include sufficient shielding to reduce radiation levels everywhere to less than 5 mR/hr at one foot from any accessible surface at maximum loading. At the maximum loading this device complies with all applicable regulations and will not require additional posting, personnel monitoring or controlling of the area.

DEVICE TYPE: Source Housing

QUALITY ASSURANCE AND CONTROL: The construction of the gauge is typical high-quality, welded steel with lead fill. These devices are tested as a function of temperature, drop, vibration and shock with the maximum drop being from a 14 foot elevated platform to an unyielding surface and vibration and shock in excess of 20Gs.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

1. This device may be distributed to either generally or specifically licensed individuals.
2. Because of the construction of the source and the nature of the radioactive material, a three year leak test interval has been granted.
3. The device is designed and supplied with sufficient information for an individual to unpack and safely mount both the source head and detector following manufacturer's instructions. Initial radiation survey and leak testing should be done by someone specifically authorized to do so.
4. All applicable services are provided by the manufacturer including training.

SAFETY ANALYSIS SUMMARY: This device was found to provide a safe method of making density, level and interface measurements in all types of industrial environments. This device will withstand acid or corrosive atmospheres, high pressures, and temperature environments up to the melting point of lead. If temperatures exceed the melting point of lead, the device will fail in an inoperable mode; that is, the first void volume closed by lead expansion will be the beam port. Short of vaporizing lead, the device should not fail in a condition that constitutes an unacceptable hazard. If the lead is vaporized, the failure will occur at the expansion plug and the lead will continue to run out until temperatures drop and the lead solidifies. In the worst case, the source will remain in the head and one will simply have an external radiation problem.

ID: TX0340[illegible] DATE: February 18, 1983

DEVICE TYPE: Source Housing

REFERENCES: This summary was prepared with the aid of the Texas Nuclear Corporation letter dated January 26, 1983 and all associated drawings, documents and procedures.

DATE: February 18, 1983 REVIEWED BY: Lloyd B. Hunter

DATE: February 18, 1983 REVIEWED BY: Joseph G. Klinger

ISSUING AGENCY: Texas Department of Health

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

NO.: NR-8027-D-801-S DATE: March 22, 1995 PAGE 1 OF 8

DEVICE TYPE: Coke Oven Machinery Alignment and Interlock Device

MODEL: Cokeray "A"

MANUFACTURER/DISTRIBUTOR: LTV Steel Company, Inc.
(Previously Republic steel Corp.)
25 West Prospect Avenue
Cleveland, OH 44115

SEALED SOURCE MODEL DESIGNATION: ICN Model 339 in Custom Source Holder,
RSC Drawing EX-7091
Tracerlab, Inc. Model CR
Texas Nuclear Corp.
Model 57157C

ISOTOPE:	MAXIMUM ACTIVITY:
Cobalt-60	300 millicuries (11.1 GBq)

LEAK TEST FREQUENCY: Six months

PRINCIPAL USE: (D) Gamma Gauge

CUSTOM DEVICE: X YES _____ NO

CUSTOM USER: LTV Steel Company, Inc.
25 West Prospect Avenue
Cleveland, OH 44115

B3/6

9503300041 11pp.

DESCRIPTION:

The Model Cokeray "A" is an industrial gauging device used to insure proper alignment of coke oven machinery during pushing operations. Proper alignment is required to protect personnel and equipment. The Cokeray "A" consists of four main parts; the source container, source bolt, shutter mechanism, and detection unit.

The source container (housing) was specifically designed for use in the high-temperature coke oven environment. It is a solid cylinder of steel 13 inches (33 cm) in diameter by 8 inches (20.3 cm) high. The ends are covered with 1.0 inch (2.54 cm) thick carbon steel plates 14 inches (35.6 cm) square. An additional solid carbon steel cylinder 7 inches (17.8 cm) in diameter and 2.0 (5.08 cm) inches long is centered at the bottom of the base plate and welded. This steel structure makes up the shielding for the device.

A hole for the source in the center of the top plate is drilled 0.781 inch (1.98 cm) in diameter to a depth of 6.25 inches (15.9 cm) to contain the source. The entrance to this hole is surrounded by a 1-8NC heavy duty stainless steel lock nut welded in place, with a 2.5 inch (6.36 cm) OD washer welded on top the lock nut. The washer provides a means for securing the source bolt in its installed position.

The Texas Nuclear Corp. source Model 57157C is installed by Texas Nuclear onto the end of the source bolt 0.688 inch (1.75 cm) in diameter and 6.75 inches 17.15 cm) long below the bolt head so that it aligns with the beam port when screwed all the way into the source hole. The source is enclosed in a stainless steel tube welded to the end of the bolt. The source is inserted into the tube, welded end of the source capsule in first, and the end of the tube is crimped after loading to secure the source in position. The head of the source bolt has holes through it for safety wires which will pass through the washer around the source bolt hole to assure the source cannot become dislodged during use.

The source bolt for the ICN Model 339 or Tracerlab Model CR Cobalt-60 source is made of 316 stairless steel measuring 7.75 inches long and 0.6875 inches (1.746 cm) in diameter. The bolt is threaded below the hex head to provide a means of securing it in its installed position. The source, containing a maximum of

DESCRIPTION (continued)

300 millicuries (11.1 GBq), is installed in the end of the bolt and secured by a stainless steel set screw.

From the side of the cylindrical shield, a beam hole is drilled 0.781 inch (1.98 cm) in diameter to a depth of 6.5 inches (16.5 cm) to intersect the bottom of the source bolt hole at right angles. The outer end of this hole is also surrounded by a 1-8NC heavy duty stainless steel lock nut welded in place. This is surrounded by a 2 NPT stainless steel locknut welded in place, and covered by a stainless steel disk (0.0625 inch (.159 cm) thick and 2.438 inches (6.19 cm) in diameter) welded in place to serve as the beam window.

The device is provided with a shutter consisting of a stainless steel cylinder 3.5 inches (8.89 cm) in diameter and 5 inches 12.7 cm) long in the direction of the beam. This is mounted on the center of a stainless steel plate 0.250 inches (0.635 cm) thick measuring 4.75 inches (12.07 cm) wide by 15 inches (38.1 cm)long. This plate is welded to a shorter plate and to a stainless steel tube 7.938 inches (20.16 cm) long which serves as the hinge to move the shutter out of the beam. The hinge is attached to one of the four 1.25 inch (3.18 cm) diameter bolts running through the four corners of the top and bottom plates. A locking plate is hinged on the bolt opposite the shutter hinge, and passes through a slot in the shutter plate with a hole for a padlock.

The device is suspended in front of the coke guide by four threaded stainless steel rods each 20 inches (50.8 cm) long and 1.25 inches (3.18 cm) in diameter. The rods are inserted through holes drilled at each corner of the top and bottom plates and secured in place with hex nuts.

The shutter will be automatically opened at appropriate times by a rigid operating arm attached to the coke guide frame and to the shutter. When the coke guide is moved toward the oven, the shutter is mechanically opened. As the coke guide moves out of the oven, the shutter is caused to close. The radiation beam from the source device located at the coke guide is transmitted through the gas space at the top of the oven. The detection unit is mounted in the operating cab of the pusher machine (approximately 70 feet (21.34 m) from the source) in such a manner that it is directly in line with the beam when the pusher ram is in proper alignment to "push" the oven. When the detector

DESCRIPTION (continued)

indicates correct alignment of the two machines, the detector actuates a control circuit which permits the ram motor to be energized. If the pusher ram and coke guide are not properly aligned on the same oven, the forward control circuit cannot be energized on the pusher ram.

This device is no longer manufactured and commercially distributed.

LABELING:

The source bolt provided by Texas Nuclear Corporation in the new model source (Model 57157C cobalt-60, 300 millicuries) is labeled in accordance with Section 20.203 of 10 CFR 20. The label also contains the model number, serial number, isotope, activity, and manufacturer's logo.

As a result of the environment in which the Cokeray "A" device is typically used, conventional radiation labels are not adequate. Conventional labels become obliterated due to heat and smoke from the cokemaking operation. Therefore, a weld bead in the form of the trefoil radiation symbol has been affixed to two sides of the source housing, and this is considered acceptable.

DIAGRAM:

See attachments 1 through 3

CONDITIONS OF NORMAL USE:

A typical coke plant operates 24 hours per day for seven days each week. During this time, the source device is totally inaccessible due to high ambient temperatures and nearby moving machinery. The closest access to the device is at a distance of approximately 10 to 20 feet (3.05 to 6.1 m).

The Cokeray "A" device is subjected to environmental conditions typical of those found in metallurgical cokemaking facilities. During normal pushing operations, when the device is in proper alignment with the oven being "pushed" the device is exposed to radiant heat from hot coke. The highest temperature that will occur is approximately 1000 F (538 C). The lowest temperature that will occur is approximately 0 F (-18 C).

CONDITIONS OF NORMAL USE (continued)

As the door machine and coke guide travel from oven to oven along the coke battery, the device is exposed to vibration similar to that of a railroad car.

The device will be cycled no more than 150 times each day.

PROTOTYPE TESTING:

Texas Nuclear Corporation's Model 57157C sealed source has achieved an ANSI N542-1977 classification of 77C65545.

The Cokeray "A" device was initially designed and manufactured by Republic Steel Corporation (RSC) in 1958 under License No. 34-811-3 (H59) issued by the U.S. Atomic Energy Commission.

The Cokeray "A" has been in operation for 36 years with no reported instances where the source shutter failed to operate properly or where loss of shielding or containment was detected.

EXTERNAL RADIATION LEVELS:

The following are the radiation profiles for the Model Cokeray "A" device containing 300 millicuries (11.1 GBq) of Cobalt-60.

DOSE PROFILE - SHUTTER CLOSED						
Position from Device	Distance from Surface of Device					
	5 cm (1.97 inches)		30 cm (11.81 inches)		100 cm (39.37 inches)	
	(mR/hr)	(mSv/hr)	(mR/hr)	(mSv/hr)	(mR/hr)	(mSv/hr)
Front	4.2	0.042	1.7	0.017	0.6	0.006
Right	32.2	0.322	7.0	0.07	NA	NA
Left	32.2	0.322	7.0	0.07	NA	NA
Top	NA	NA	NA	NA	NA	NA
Bottom	25.2	0.252	3.8	0.038	0.7	0.007
Back	NA	NA	NA	NA	NA	NA

* Calculated radiation level
NA - Not accessible

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

NO.: NR-8027-D-801-S DATE: March 22, 1995

EXTERNAL RADIATION LEVELS (continued)

DOSE PROFILE - SHUTTER OPEN						
Position from Device	Distance from Surface of Device					
	5 cm (1.97 inches)		30 cm (11.81 inches)		100 cm (39.37 inches)	
	(mR/hr)	(mSv/hr)	(mR/hr)	(mSv/hr)	(mR/hr)	(mSv/hr)
Front*	1930	19.3	462	4.62	78.0	0.78
Right	32.2	0.322	7.0	0.07	NA	NA
Left	32.2	0.322	7.0	0.07	NA	NA
Top	NA	NA	NA	NA	NA	NA
Bottom	25.2	0.252	3.8	0.038	0.7	0.007
Back	NA	NA	NA	NA	NA	NA

* Calculated radiation level
NA - Not accessible

QUALITY ASSURANCE AND CONTROL:

Quality assurance and control programs are not required for custom devices.

The newer sources used these devices were made by Texas Nuclear Corporation, whose Quality Control and Assurance consist of the following as a minimum:

- Test procedures
- Leak test of each source
- Check finished source against dimensional specifications
- Records

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- These devices shall only be used by LTV Steel Co., 25 West Prospect Avenue, Cleveland, Ohio 44115.
- The source capsule in this device shall not be subjected to environmental or other conditions of use which exceed those for ANSI N542 classification of 77C65545.
- The source in this device shall be leak tested at intervals not to exceed six months. The test shall be capable of detecting the presence of 0.005 microcurie of the radionuclide on the test samples.
- Installation, maintenance, storage, use, transfer and disposal are to be determined by the licensing authority.
- The radiation shield on the device shall be locked in the safe position any time the device is not in operation.
- This registration sheet and the information contained in the references shall not be changed without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

During use, the device is inaccessible to personnel due to environmental conditions and physical constraints. The device is physically located a minimum of 15 feet (4.57 m) from employees.

Due to the simplicity of the shutter design (no operating parts such as solenoids or air cylinders) it is highly unlikely that the shutter mechanism would fail when the oven is not being operated.

Based on our review of the information and test data cited in the references below, and the claimed ANSI N542 classification for the sealed source, we continue to conclude that LTV Steel Corporation's Model Cokeray "A" device is acceptable for custom licensing purposes.

SAFETY ANALYSIS SUMMARY (continued)

Furthermore, we continue to conclude that this device would maintain its containment and shielding for normal conditions of use which might occur during the uses specified in the registration sheet.

REFERENCES:

The following supporting documents for the Model TC 04564 were reviewed for this report.

- LTV Steel letter dated May 9, 1989, requesting change in source supplier
- LTV Steel letter dated October 18, 1989, with additional information
- LTV Steel letter dated August 6, 1991, requesting change to custom device registry
- LTV Steel facsimile dated March 22, 1995, requesting change from custom to inactive

ISSUING AGENCY:

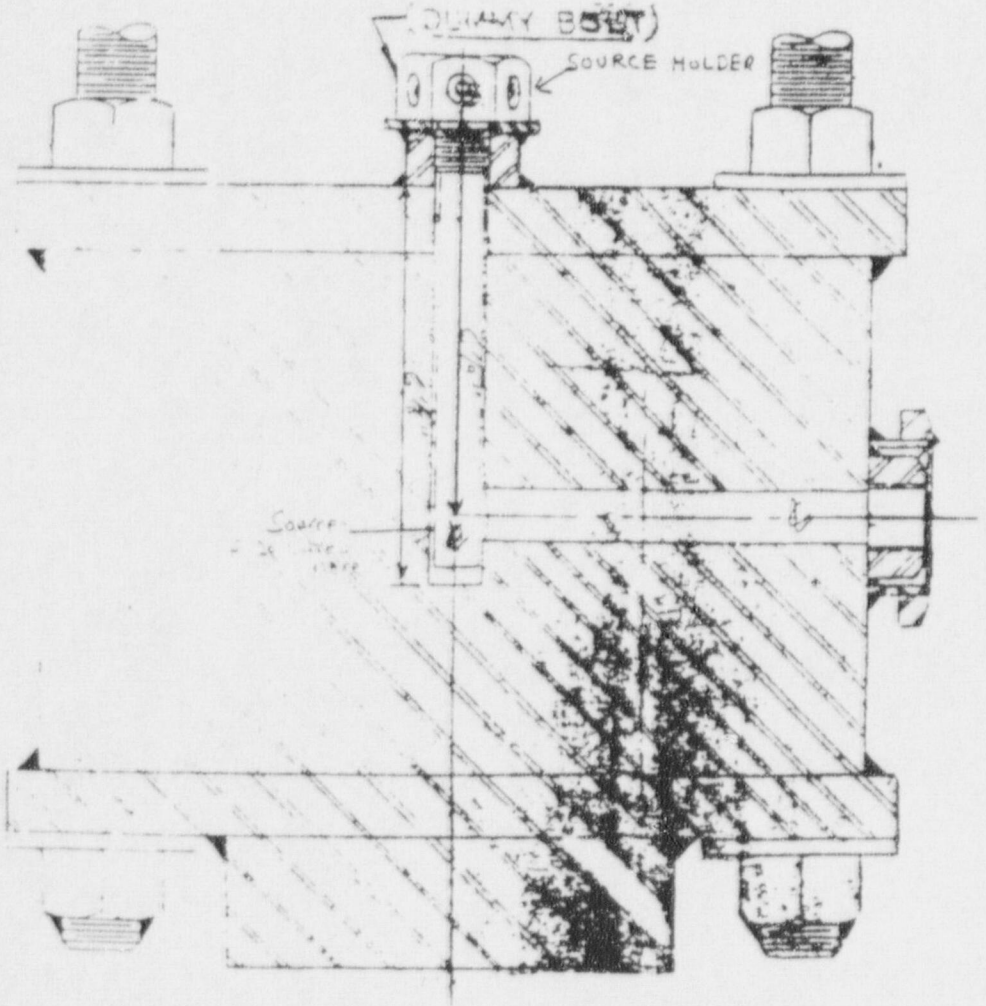
U.S. Nuclear Regulatory Commission

Date: March 22, 1995 Reviewer: Thomas W. Rich

Date: March 22, 1995 Concurrence: Steven L. Baggett

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

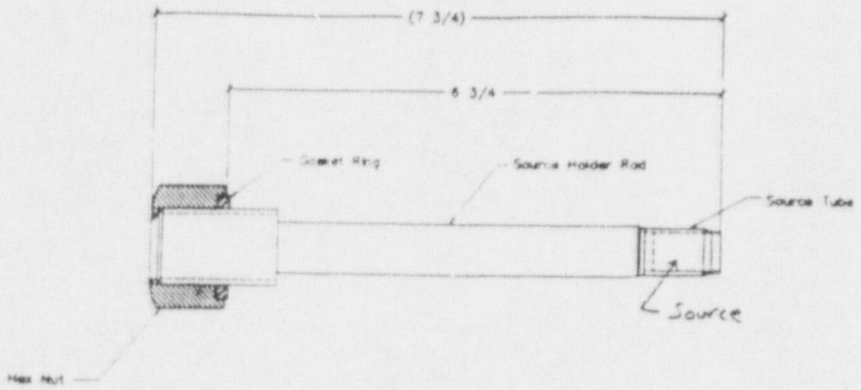
NO.: NR-8027-D-801-S DATE: March 22, 1995 ATTACHMENT 1



SOURCE HOUSING

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

NO.: NR-8027-D-801-S DATE: March 22, 1995 ATTACHMENT 2



SOURCE HOLDER

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

NO.: NR-8027-D-801-S DATE: March 22, 1995 ATTACHMENT 3